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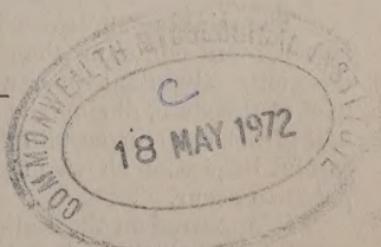
PURDUE UNIVERSITY

AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 32, VOL. II. JULY, 1890.

- (1) Treatment of smut in wheat.
- (2) Field experiments with wheat.
- (3) A note on two inferior fertilizers.

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TREATMENT FOR SMUT IN WHEAT.

BY J. C. ARTHUR.

The bulletin on smut of wheat and oats (No. 28) issued by this station September, 1889, has served to bring out additional information regarding the prevalence of smut in different parts of the state. A more intimate acquaintance with the actual facts, and in consequence a better realization of the loss from smut sustained by the Indiana farmers, has made it seem advisable for the station to devote considerable attention to the subject. The results of the study, since the publication of the last bulletin, are given in the following pages. Investigations will be continued during the coming year.

The last discussion on the subject gave an account of the structure and development of the smut fungus, of the manner in which it affects the host plant, its mode of distribution and various historical facts. It will, therefore, be unnecessary to treat of these subjects in the present connection. The former bulletin also gave directions for treating the seed and other methods by which smut may be destroyed and kept in check. At that time no experimental work had been done by the station, and only the experience of others could be given.

The present article will be devoted to methods of treating seed for the prevention of smut, based chiefly upon experimental data, and especially to the new and remarkably effective method of hot water treatment.

Stinking smut of wheat (Bunt).

The stinking smut of wheat, or bunt as it is sometimes called, is far more common than heretofore suspected, and has been especially abundant over a considerable portion of the northern part of the state, during the present season (1890). A loss of one half of the crop in certain fields has not been uncommon, and a careful inspection shows many fields affected where it was not supposed to occur.

It appeared on the station farm this year among the plats devoted to the testing of varieties. Only one variety (Hermes-winter) was affected. In this plat 5315 heads were counted, of which 491 were bunted, or 9.24%. The yield of this plat will be devoted the coming season to testing methods of prevention on a scale for farm use.

By carefully noting the two items of the total germination and germination for the first twenty four hours there can be no hesitation in saying that the lots ranging from 135° for ten minutes upwards were injured to some extent by the treatment, none of them showing as large a total for either the first twenty-four hours, or for the whole time as the untreated seed. The injury to those treated at 135° for ten minutes and at 140° for five minutes amounted to about twenty per cent., and to a considerable more for the more strongly treated.

More complete experiments with oats, not yet published, have shown that the number of germinations during the first day holds a more important relation to the harvest than the total germinations. Assuming this to be true in the case of wheat, we find that the seed treated at 130° for five, ten and fifteen minutes and at 135° for five minutes were materially benefited by the treatment, showing from 1.2 to 4.7 per cent. advantage over the untreated. Further comparisons may be made by referring to the following table:

PERCENTAGE OF GERMINATION OF HOT WATER TREATED WHEAT AT THE END OF TWENTY-FOUR HOURS AND OF FIVE DAYS.

	No. seeds.	TREATMENT.	24 hrs.	5 days.
Uninjured by treatment.	600	54° C. (130° F.) for 5 min.	14.5	90
	600	54° C. (130° F.) for 10 min.	12.5	93
	600	57° C. (135° F.) for 5 min.	12.4	91
	600	54° C. (130° F.) for 15 min.	11.0	86
	600	<i>Untreated</i>	9.8	94
	600	51° C. (125° F.) for 15 min.	9.5	91
	600	51° C. (125° F.) for 10 min.	9.2	95
Injured by treatment.	600	60° C. (140° F.) for 5 min.	6.7	73
	600	57° C. (135° F.) for 10 min.	5.2	82
	600	57° C. (135° F.) for 15 min.	1.7	65
	600	63° C. (145° F.) for 5 min.	1.0	62
	600	60° C. (140° F.) for 10 min.	.7	65
	600	66° C. (150° F.) for 5 min.	0	33
	600	63° C. (145° F.) for 10 min.	0	20

From all the data at hand we arrive at the conclusion that to treat seed wheat with hot water in order to prevent smut it should be immersed for five minutes in water at 135° F.; if the temperature drops below this point, the seed should be left in the water a little longer time, and if the temperature rises above it, the time should be shortened. A greater variation

than five degrees above or below the 135° F. should be guarded against. The practical details of the operation are the same as for oats, which have been given in the footnote on page 4.

Loose smut of wheat.

This form of smut is more universal, but not so injurious as the stinking smut. It ripens about the time the wheat is in flower; by harvest time the spores have been distributed by the wind and rain, and instead of a head of sound wheat nothing remains but the bare pointed end of the main stalk. Such smut denuded stalks must be very numerous to attract attention, which doubtless partially accounts for the comparatively little notice which has been given the subject.

Among the plats of wheat on the station farm devoted to testing varieties, the Original-red and the Ontario-wonder appeared to contain enough loose smut this last season to make it worth while to obtain a careful estimate. The results of the observations are given in the following table:

Variety	Height of healthy stalks	Height of smutted stalks	No. of stalks counted	No. of stalks smutted	Per cent. of smut
Original-red . . .	52 in.	52 in.	2892	335	11.58
Ontario-wonder	54 in.	44 in.	1663	406	24.41

The results show a loss of over a tenth in one case, and nearly a quarter in the other, of a possible crop. In neither case is it probable that anyone, looking at the wheat as it stood in the field, would have ventured on a higher estimate than five per cent. Is it not likely that there is far more loss in the wheat fields of the state from loose smut than has been supposed?

As a rule smutted stalks are shorter than healthy ones; and more or less hidden by them. In the Ontario-wonder variety the usual observation held good, the average difference in actual height being ten inches. In the Original-red variety, however, it was apparent upon casual observation that there was something unusual in the habit of the smutted plants. They stood well up above the nodding heads of the healthy plants, making them unusually conspicuous. Upon measurement it was found that they were of the same height as the healthy plants, and owed their prominence entirely to being erect. Whether the difference of habit in this instance was due to a difference in the nature of the smut or of the wheat it is impossible to say.

The prevention of loose smut of wheat has not been made the subject of experiment, but it is presumable that the treatment recommended above for stinking smut will be found satisfactory.